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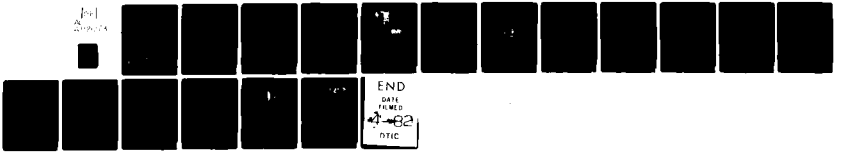

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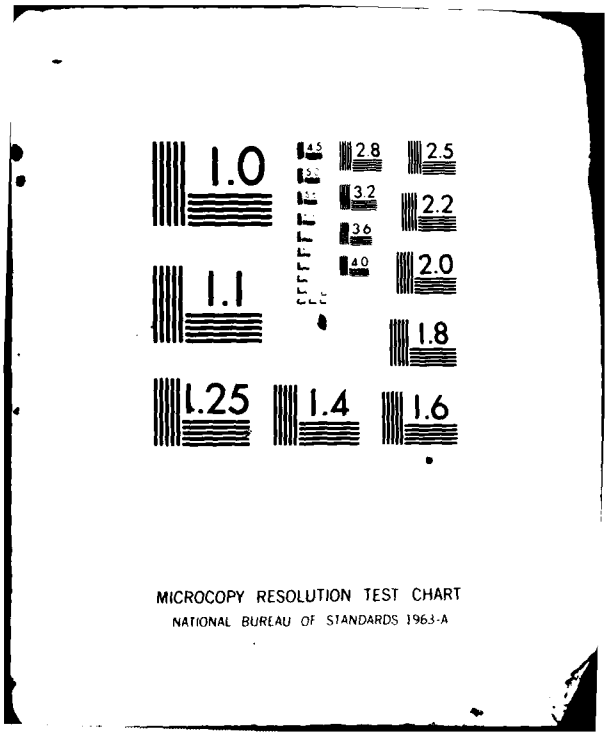
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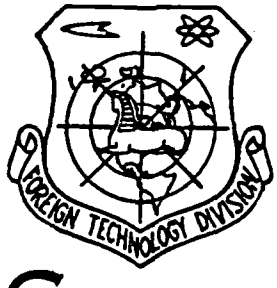
FOREIGN TECHNOLOGY DIVISION

WIND PATTERNS AROUND THE TARCU MASSIF

by

Constantin Trenia, Cristescu Stefania



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WIND PATTERNS AROUND THE TARCU MASSIF

Constantin Trenia, Cristescu Stefania

ABSTRACT

Synthetically given are both the wind occurrence and the speed characteristics spotted between 1961 and 1965 at the weather station on top of the Tarcu Massif.

The wind effects in the rearrangement of the snow blanket and the development icings (rime and glaze)are mode conspicuous .

The movement of air or current of air in the horizontal direction is termed wind. Wind is characterized by two fundamental properties: direction and speed.

In order to monitor the wind direction, one uses 16 directions. The wind direction is recorded in degrees of horizon circumference starting from the north, N, at zero degrees and proceeding clockwise to 360 degrees.

The speed of the wind is expressed in the distance in meters that is traveled by the wind in one second.

The speed and the direction of the wind usually vary.

The wind pattern is influenced by the different height patterns that traverse the country.

On the territory of the Romanian Socialist Republic, the Carpathian Mountain chain creates special conditions in the wind pattern. The relief (mountains, hills) can also cause wind enhancement in some locations and a weakening in others.

The physico-geographical conditions cause great differences in the warming pattern of the subjacent surface and favor the local circulation.

In some cases, the presence of small heights can increase the air turbulence.

The diversity of orographic conditions in our country makes necessary the study of the Aeolian pattern in the mountaneous region, especially.

The data on the wind direction and speed observed at the Tarcu Massif weather station over the period 1961-1965 was analyzed within this scope.

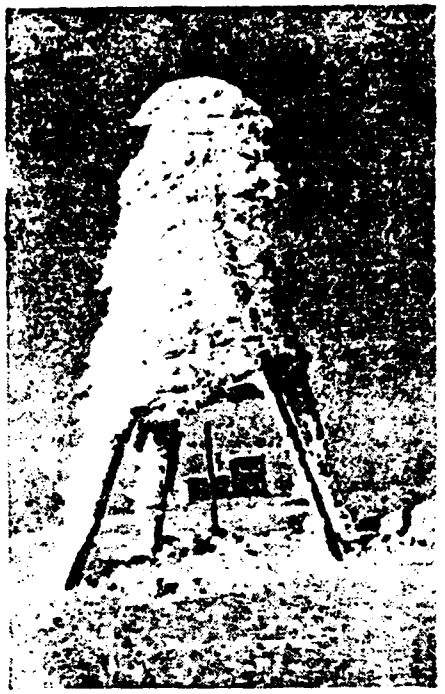
The wind monitoring was performed using both a light plate and heavy plate vane.

On days when the rime developments prevented the vane use, the meteorological observation was performed with an anemometer.

THE PHYSICO-GEOGRAPHICAL DESCRIPTION

The Tarcu Massif weather station is located at an altitude of 2,180 meters and has geographical coordinates of 45° 15' north latitude and 22° 31' east longitude.

The station is built on the Tarcu Massif in the Tarcu mountain range in the NW region of the Southern Carpathians.



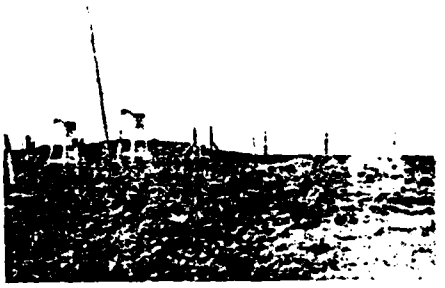


Figure 1. The weather station building seen through the trigonmetric point from the Tarcu Massif at a distance of 200 meters from the lodge (1966).

Figure 2. The platform of the weather station in summer (1965).

Valea Marului, a tributary of the Bistra, divides this range into two sub-units.

The Tarcu Massif in the SE and the Petreanu Massif in the NE.

The Tarcu Massif is more compact, with heights which vary between 1500 meters and 1800 meters, dominated by the Tarcu Summit at 2180 meters where the weather station is located.

This Massif is connected to the Godeanu Massif through a ridge that does not drop under 1100 meters and which borders the FNE site of the Tarcu Massif weather station. The Caleanu summit

TABLE 1. WIND FREQUENCY AND SPEED 1961-1965.

(1)

Direc.	N		NE		E		SE		S		SV		V		NV		Calm
(2) Anul	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	(3)
1961	326	4389	265	4437	39	359	141	2137	171	1572	127	1009	101	753	92	1105	198
1962	247	3174	183	2155	98	878	200	2303	265	2431	145	1129	113	841	115	1374	96
1963	274	3710	146	1422	135	1357	250	2658	228	2040	109	988	89	693	113	1313	116
1964	321	4501	240	2452	104	848	213	1954	217	2060	102	881	50	336	96	1167	123
1965	273	3766	169	2105	43	365	183	1867	239	2162	139	1103	109	801	150	1469	155
1961 – 1965	1441	19540	1003	12571	419	3807	987	10919	1120	10265	622	5110	462	3424	566	6425	688
(4) media	13.6		12.5		9.1		11.1		9.2		8.2		7.4		11.4		

(1). direc = direction; (2). anul = year; (3). calm = calm; (4) media = average; n = number of cases; s = sums.

is found 3 km away to the NNE. The analyzed and compiled data are shown in Tables 1, 2, and 3.

From the analysis of the wind data over a five year interval, 1961-1965, one notices that the prevailing wind direction is N with a total of 1441 cases (19.9%) followed by S with 1120 cases (15.3%) and 1003 cases (13.7%) for the NE direction.

The lowest wind frequency belongs to the E direction with 419 cases (5.7%).

The analysis of the wind pattern shows that the wind frequency expressed in percentages is 19.9% in the N sector, 15.3% in the S, 13.7% in the NE sector, and 5.7% in the E.

TABLE 2.

Frecventa %	N	NE	E	SE	S	SV	V	NV	Calm
Frecventa in % 1961–1965	19.9	13.7	5.7	13.5	15.3	8.5	6.3	7.7	9.4

frecventa % = frequency %; calm = calm.

Figure 3. Cloud gatherings.

The case of calm weather in the 1961-1965 interval numbered 688 which corresponds to 9.4%.

During the year, the general atmospheric circulation also changes the wind speed.

An agreement between direction and speed is observed on the Tarcu Massif.

One can say that the N wind has the highest speed, 13.6 m/s, followed by the NE direction with 12.5 m/s, NW with 11.4 m/s and SE with 11.1 m/s.

TABLE 3. WIND FREQUENCY ACCORDING TO THE MONTHS.

Luna / Directia		N	NE	E	SE	S	SV	V	NV	Calm
Ianuarie	1	16.8	15.6	6.8	16.0	14.7	7.6	6.3	7.7	8.5
Februarie	2	23.0	20.6	4.2	11.0	12.9	3.9	4.4	10.5	9.5
Martie	3	17.8	14.7	2.9	10.6	17.1	12.7	8.2	9.4	6.6
Aprilie	4	12.6	13.8	11.3	15.8	13.2	8.2	5.0	8.8	11.3
Mai	5	18.7	18.1	7.6	12.6	10.4	7.1	7.7	8.8	9.0
Iunie	6	24.7	17.6	7.1	10.7	11.8	6.7	4.3	7.3	10.7
Iulie	7	26.5	14.5	2.1	9.0	11.5	7.1	7.9	7.2	14.2
August	8	25.8	10.0	4.7	13.4	14.4	5.8	4.8	8.9	12.2
Septembrie	9	24.0	16.6	8.2	11.7	16.8	8.0	5.5	4.7	10.5
Octombrie	10	16.0	14.5	5.4	25.6	14.5	5.0	3.7	5.3	10.0
Noiembrie	11	16.0	5.8	3.3	14.5	23.0	16.0	9.7	7.2	4.5
Decembrie	12	15.1	10.1	5.1	11.0	23.5	13.9	8.1	7.2	6.0

luna = month; directia = direction; calm = calm;
1--January; 2--February; 3--March; 4--April; 5--May; 6--June;
7--July; 8--August; 9--September; 10--October; 11--November;
12--December.

Analyzing the wind frequency evolution over the year, one can see that during the warm period the prevailing direction is N (June 24.7%, July 26.5%, August 25.8%, September 24.0%).

During April and October the prevailing direction is SE. In the winter, the southern sector dominates (November 23.0%, December 23.5%).

Frequency of Calm Weather.

The wind, based on its character, is a meteorological element with intermittent action. It can be statistically recorded by the proportion of the presence or absence of observed calm weather.

The summit of the Tarcu Mountains has a climate that is truly dynamically advective, being exposed to air currents.

The wind blows almost the entire year, but during the warm season the frequency of calm weather is greatest (in July 14.2%, in August 12.2% and in April 11.3%).

Less frequent were the cases of calm in November, 4.5%, followed by December, 6.0%, and by March, 6.6%.

Unlike the surrounding lower regions, the climate on the Tarcu Massif is characterized by a high frequency of winds.

The air currents can have different intensities, however. Analyzing the wind direction and frequency according to the seasons, it is noticed that regardless of the season, the highest frequency and speed are always registered for the N sector.

During the winter, the prevailing wind direction is N (18.4%) followed by NE (15.3%), S (17.1%) and SE (12.6%).

Spring and Summer.

By analyzing the material under study it can be seen that even during these seasons the prevailing wind direction is from the N (16.4%) followed by NE (15.9%), SE (13.0%) and S (13.6%) during the spring and from the N (25.7%), NE (13.7%) followed by SE (10.5%) and S (12.6%) in the summer.

During autumn, the direction most favored is still from the N (18.6%) followed by SE (17.4%) and S (18.1%).

Less frequent are the winds from the W (7.0%) in the spring and from the E (4.6%) in the summer, from the E and NW (5.6% and 5.7%) in the fall and from the E (5.4%) in the winter.

TABLE 4.

Directia / Anotimpul		N		NE		E		SE		S		SV		V		NV		Calm
		N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	
Primavara		302	4037	286	3546	133	1214	239	2722	250	2307	172	1439	129	927	166	1812	165
	Viteza m/s	13.4		12.4		9.1		11.4		9.2		8.4		7.2		10.9		
	Frecventa%	16.4		15.9		7.2		13.0		13.6		9.3		7.0		9.0		9.0
Vara		472	5530	252	2507	85	643	193	1826	231	1545	120	735	105	635	144	1449	228
	Viteza m/s	11.7		9.9		7.6		9.5		6.7		6.1		6.0		10.1		
	Frecventa %	25.7		13.7		4.6		10.5		12.6		6.5		5.9		7.9		12.5
Toamna		339	4043	189	2253	103	1052	316	3896	329	3228	175	1396	114	820	104	1162	152
	Viteza m/s	11.9		11.8		10.2		12.3		9.8		7.9		7.2		11.2		
	Frecventa %	18.6		10.4		5.6		17.4		18.1		9.6		6.2		5.7		8.4
Iarna		328	5930	276	4265	98	898	229	2475	310	3185	155	1540	114	1042	152	2105	143
	Viteza m/s	18.1		15.4		9.2		10.8		10.3		9.9		9.1		13.8		
	Frecventa %	18.4		15.3		5.4		12.6		17.1		8.6		6.3		8.4		7.9

directia = direction; anotimpul = season; primavara = spring; vara = summer; toamna = fall; iarna = winter; viteze m/s = speed m/s; frecventa % = frequency %; n = number of cases; s = sum.

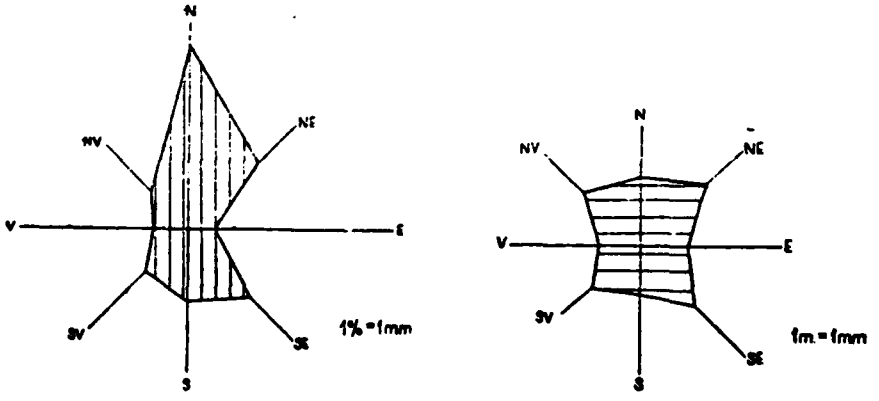


Figure 4. The graphic presentation of the wind frequency.

This fact underscores the invasion of cold arctic air masses from the N sector during the cold season, in contrast to the warm air present in the warm season in this region.

From the analysis of the 8 graphs presenting the wind frequency and speed rose, it is clear that:

The prevailing wind, in terms of intensity and number of cases the frequency express in %), is from the N sector.

Analyzing the days with strong wind, with a speed of 16 m/s, on the Tarcu Massif shows the following:

In 1961 there were 229 days with wind of 16 m/s with maxima in March (26 days) and August (13 days).

In 1962 there were 192 days with wind of 16 m/s. In November there were 23 days and in October there were only 10 days.

In 1963 there were 212 days with speeds of 16 m/s. Most of them occurred in August, while the least number were in April with only 9 days.

In 1964 there were 164 days with speeds of 16 m/s out of which the most occurred in January (20 days) and the fewest in June (4 days).

In 1965 there were (note of translator*)days of wind with speeds of 16 m/s. The most days with strong wind were in February (23 days) and the fewest in October (7 days).

It can be said that on the average there were 194 days with winds of 16 m/s per year.

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*Number missing in foreign.

Analyzing the days during which the wind had a strength between 35-40 m/s over the 1961-1965 interval, the following can be noted:

In 1961 there were 34 cases — 7 of them during March; in 1962, 13 cases occured, 5 of them in February; in 1963, there were 3 cases (in 3 different months--February, March and December).

In 1964, there were 10 cases, with 5 occurring in January. In 1965 there were 10 cases in February, and in April, 3 cases.

The large number of days with strong winds has a bad effect on the vegetation, which, as it is very sparse, dries out in the warm season.

The violence of the wind develops unrestrictedly over the open surface of the higher plateaus. Often on the ridge, the wind blows for days on end like a fierce hurricane.

Its intensity is irregular and so is the speed with which the air masses move. Days with less intense wind alternate with those of very strong winds. The wind duration as well as its speed is very irregular.

In the winter, the wind is accompanied by strong snow storms which give rise to snow drifts of appreciable heights of over 2 m. For example, in the winter of 1965 when the meteorological platform was under a snow storm (1/9/65) the snow drifts around the weather station were higher than 3 m.

These strong wind days are usually accompanied by heavy fog days, where the sky is not visible. In these situations, visibility is under 50 m. These two factors, the wind and fog, determine the formation of ice deposits, of rime.

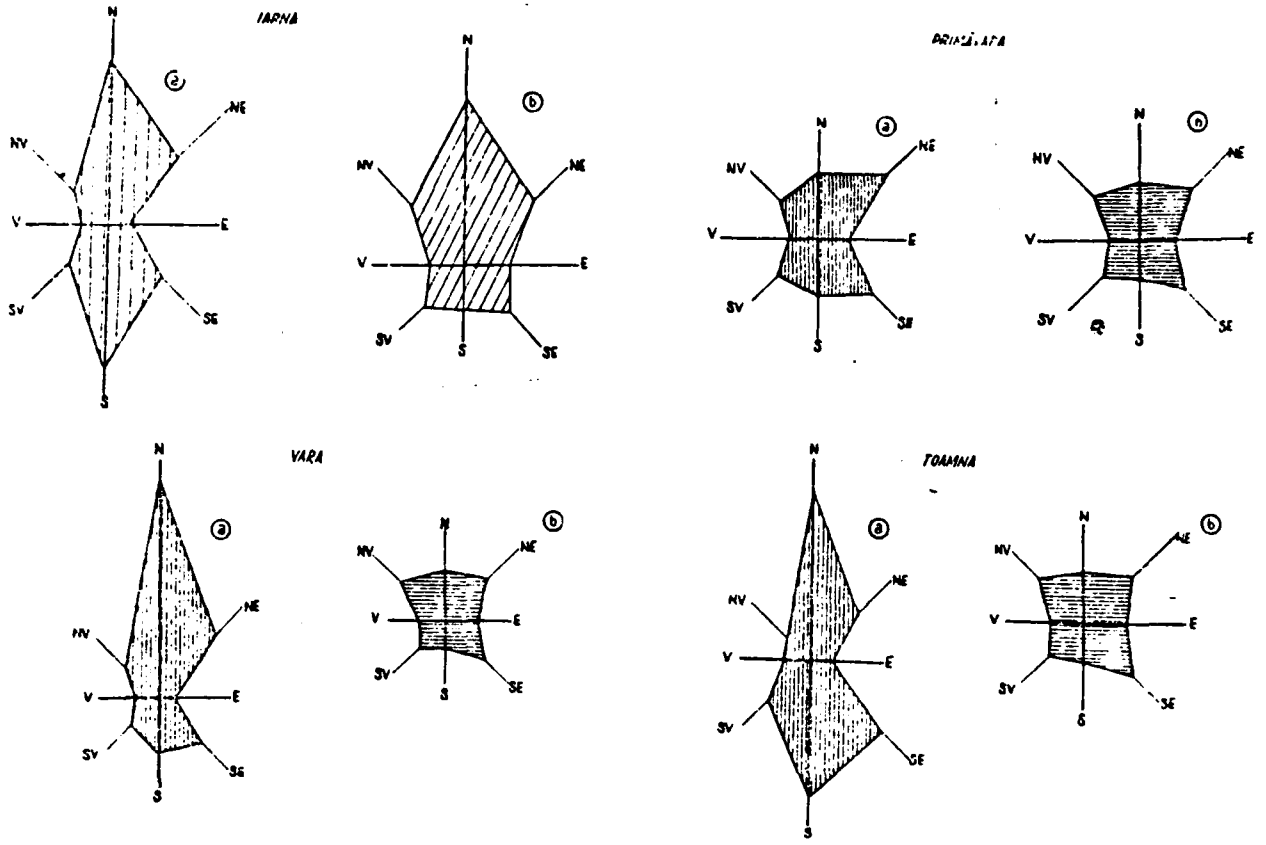


Figure 6. Wind frequency and intensity rose according to seasons.
a) frequency rose; b) intensity rose.

Rime develops heavily all year long. During the cold six months of the year, it reaches dimensions of 1 to 1.5 m. In Figure 7 one can see the Tarcu Massif weather station encased in rime. In the foreground one can see the fenceposts.

In Figure 8 one can see the meteorological platform under ice. The dimensions reached by the deposits in the winter are seen in Figure 9.

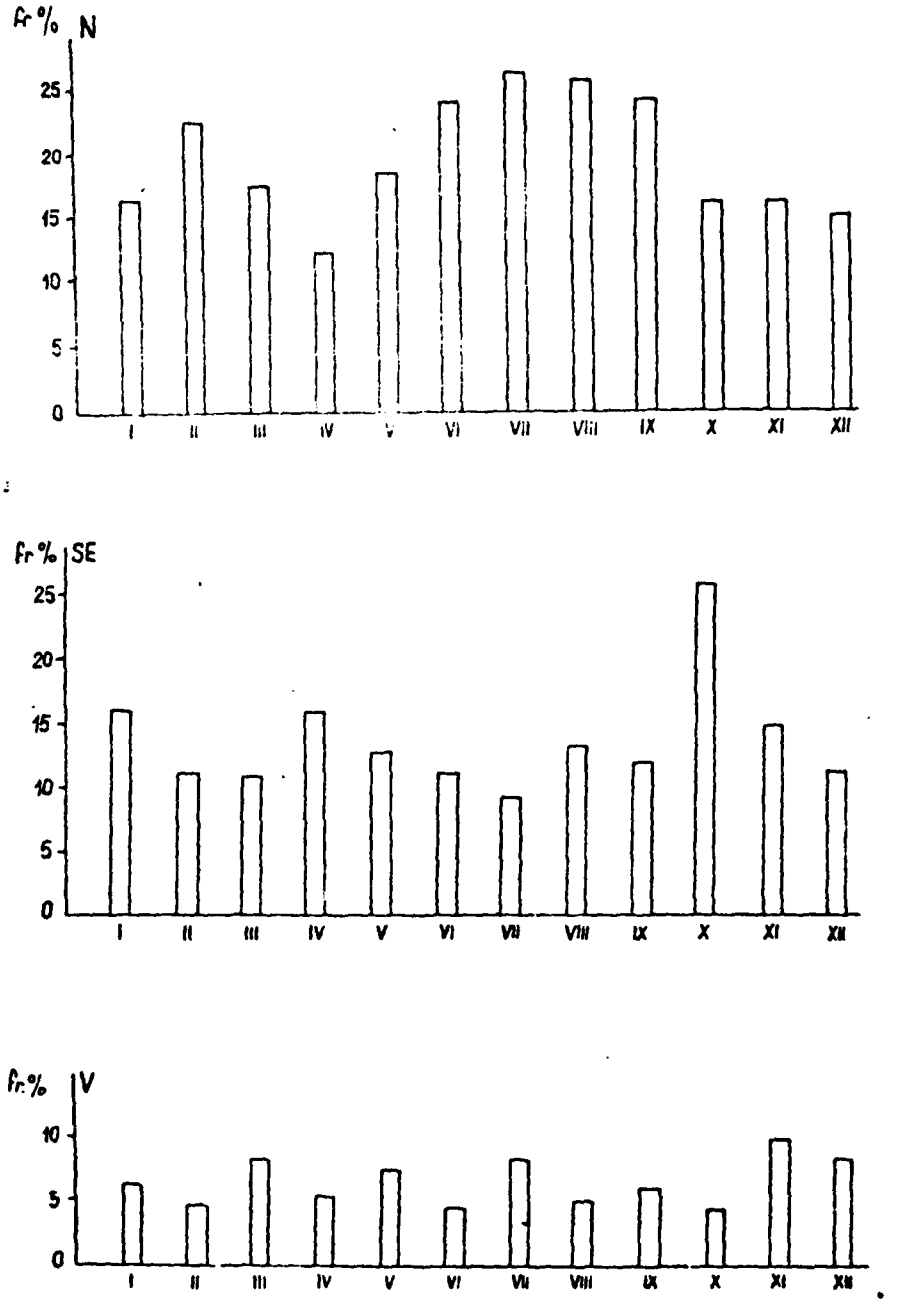
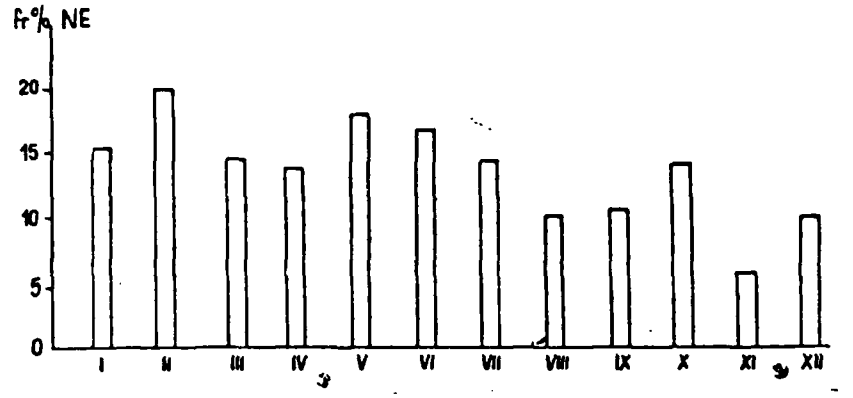
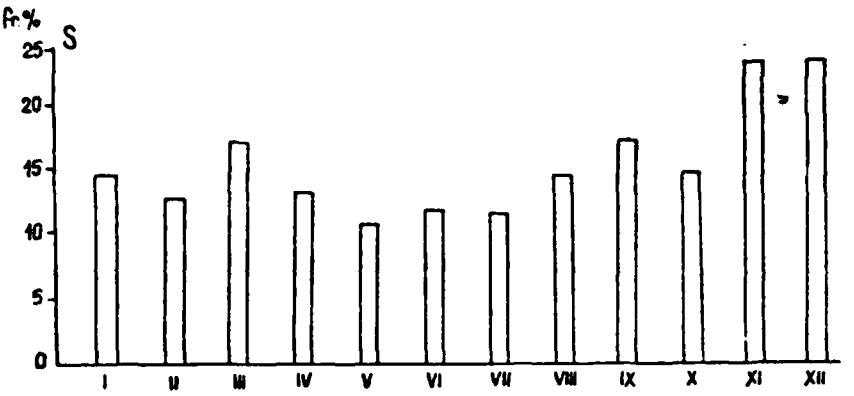


Figure 5. The graph wind frequency in %-age according to months.





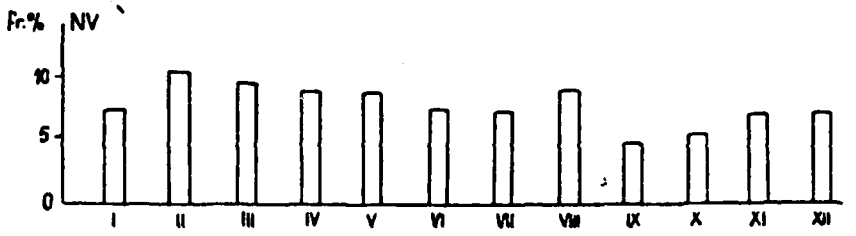
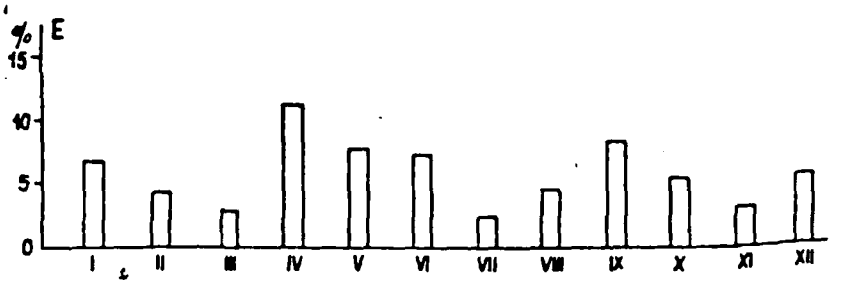
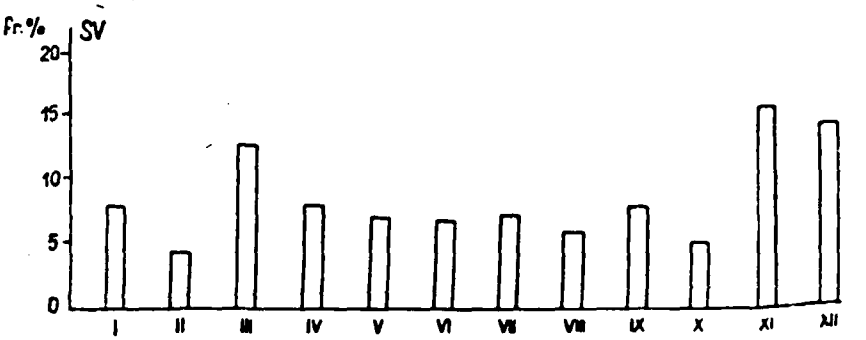


Figure 5. (cont'd)





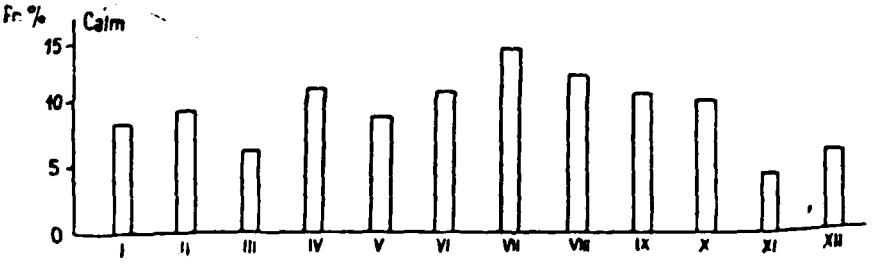


Figure 5. (con'd)

Figure 9. The dimensions reached by the deposits in the winter.

Figure 10 shows the appearance of the meteorological shelters, after a few days of fog, strong winds and low temperatures.

The character of the deposits is illustrated in Figure 11. The hard rime which is formed has a scaly look and usually is deposited in the N-S direction.

Conclusions.

1) The wind is the most important element for the Tarcu Massif weather station. It has a significant influence on the weather conditions, affecting the climate greatly.

2) In the Tarcu Massif the prevailing wind direction is from the N; the highest wind speeds are observed from this direction.

Figure 10. The appearance of the meteorological shelters after a rew days of fog, strong winds and low temperatures.

Figure 11. The aspect of deposits — the hard rime formed has a scaly appearance.

3) During the cold season of the year, the snow is piled into large snowdrifts.

4) The wind has a great effect of the rime formation when it takes place on foggy days with low temperature.

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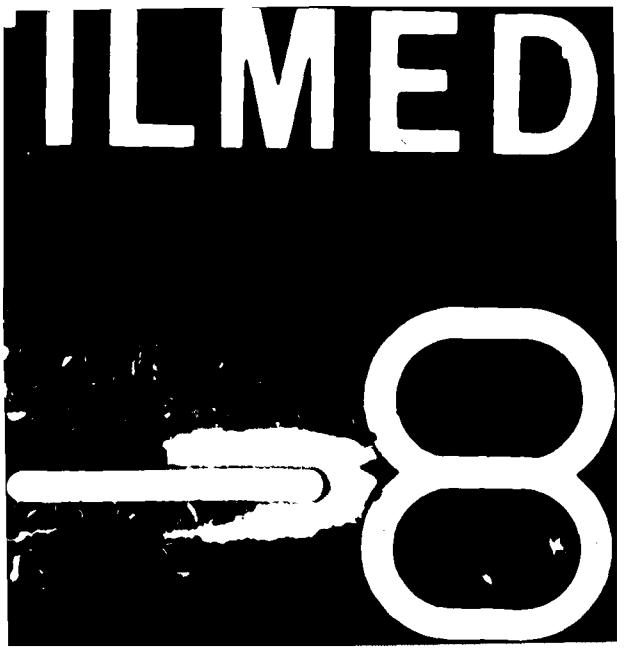
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